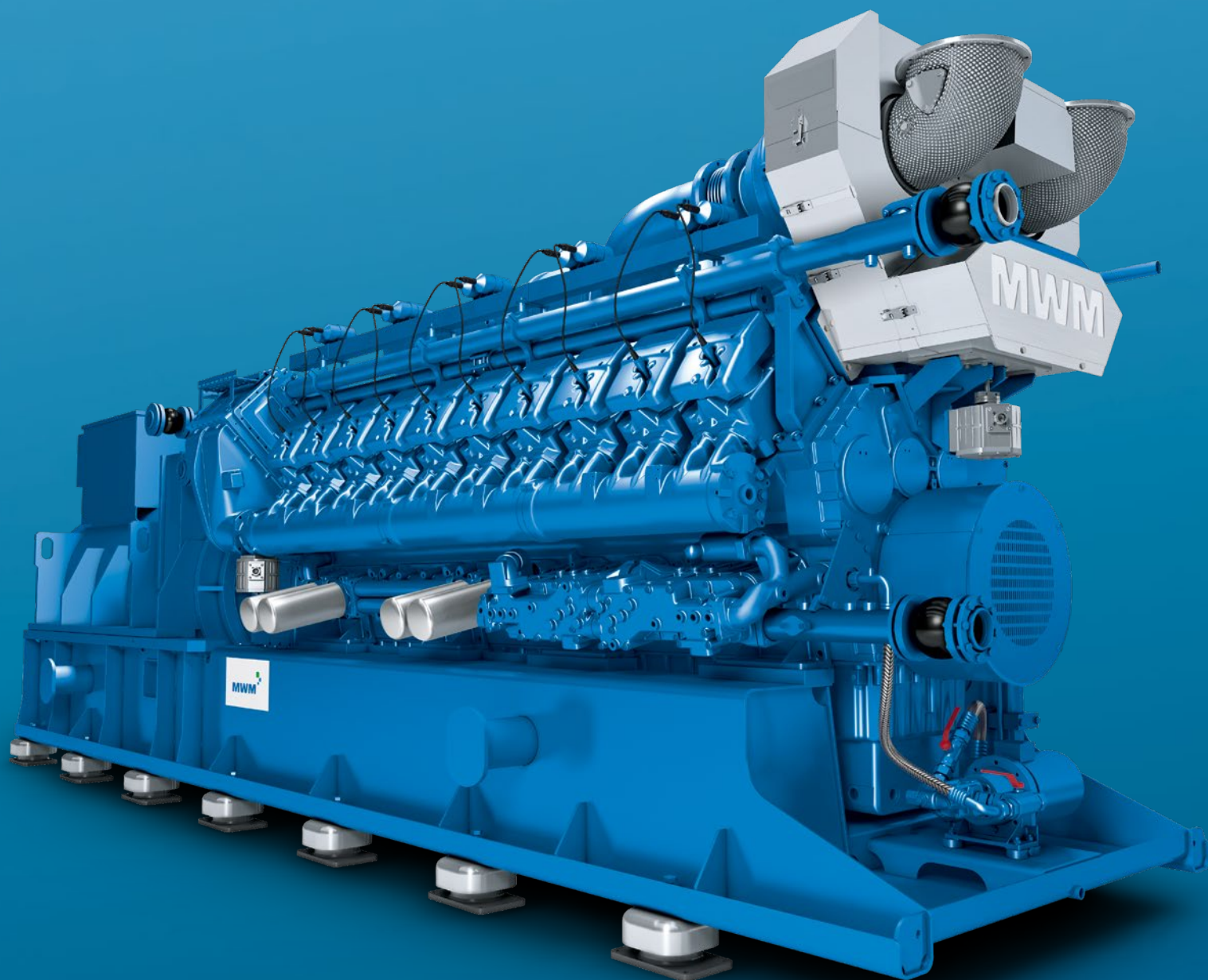


TCG 2020

Top marks for ecology and economy.

For natural gas and biogas with an output from 1,000 to 2,000 kW_{el}



Our experience for your success.

The TCG 2020. Top performance from MWM – used successfully worldwide.

Strong partner for your progress

With MWM you can benefit from more than 145 years of experience in gas engine technology and energy production. Since 2011 the traditional company, Motorenwerke Mannheim, has belonged to the worldwide network of Caterpillar Inc. This gives us an even more unique expertise that benefits you in the development of individual complete solutions.

Worldwide successful technology

MWM offers you the confidence and experience of a specialist who has already successfully installed hundreds of biogas systems with gas power plants within and outside of the European region. Efficiency and reliability are the decisive factors everywhere.

Competent, reliable, and uncomplicated

We want you to be satisfied with us in every phase of the project: That is why we clearly spell out all agreements in a written order confirmation with a detailed schedule. MWM stands for reliability and quality of planning, right down to commissioning.

We stick to our agreements

If you put great value in an optimal return on your investment in a biogas system and smooth handling, MWM is a natural first choice. We offer comprehensive experience and always keep a close eye on the entire process. Seamless and turnkey ready – from initial consultation to handling of the completed system by our customer service. We say what we do, and we do what we say.



NanJi Water Recycle Centre, Korea

Korea District Heating Corp. is one of the largest suppliers of district heating in the world. In March 2013, two TCG 2020 V16 engines were taken into operation, providing an electrical output of 1.6 MW each. The units are part of the first plant installed in South Korea that generates electricity and heat from biogas.

2 x MWM TCG 2020 V16 | Commissioning: 2013



Queen Elizabeth University Hospital, UK

The modular CHP plant consists of three MWM manufactured TCG 2020 V12 gas engines with a combined output of 3.6 MW_{el} and 3.6 MW_{th} with an absorption chiller for cooling, the MWM gas engines have a potential to deliver an annual energy saving of up to £ 1 million and a carbon emission reduction by around one fifth.

3 x MWM TCG 2020 V12 | Commissioning: 2014

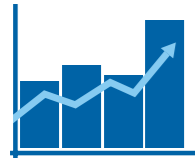


STOR, UK

10 MW_{el} containerised peak-opping power plant provides security and stability to the grid and can be demanded during peak hours or during high electrical demand. The goal was to achieve a quick ramp-up time with the TCG 2020 V20 genset to meet the demand of the grid.

5 x MWM TCG 2020 V20 | Commissioning: 2014

Top marks for ecology and economy.



More profit

The TCG 2020 is highly efficient thanks to its optimized inlet duct, combustion chamber and spark plugs. Save as much as 15% per annum on fuel costs – and increase your plant's profitability.



Less overall cost

With its optimized engine components, the TCG 2020 requires up to 50% less lubricating oil than other similar gensets. In terms of efficiency that means long-term savings.



Different engines to suit your needs

Whether you need high efficiency or an optimized standalone unit with good load compensation and black start properties – we can provide you with an engine tailored exactly to your needs.



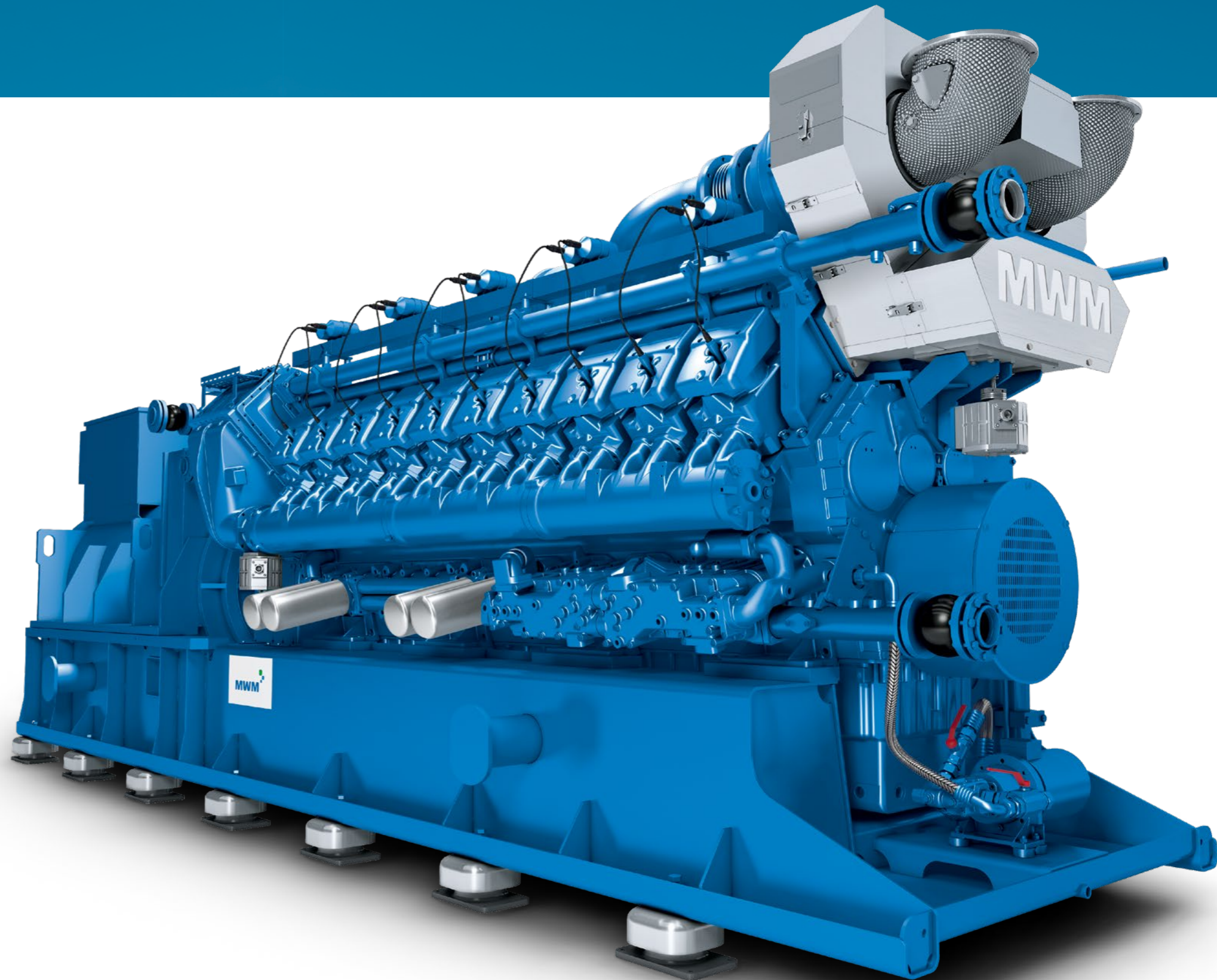
Optimum control concept

TEM (Total Electronic Management) controls not just the engine but the entire system including the heat supply from cogeneration. Temperature monitoring for each cylinder and anti-knock control ensure the best possible utilization of fuel and maximum power output, even if gas composition fluctuates.



Flexible usage

The latest technology such as our gas-mixer and TEM allows you to use a wide variety of gases. Even the most problematic gases such as coal mine gas, land-fill gas and sewage gas can be used without difficulty.



Technical data 50 Hz

| Engine type | TCG 2020 | V12 (i.o.) ¹⁾ | V12 K 1 ¹⁾ | V12 K ¹⁾ | V12 ²⁾ | V16 K ¹⁾ | V16 ²⁾ | V20 ²⁾ | V20 (iHE) ²⁾ |
|----------------------|-------------------|--------------------------|-----------------------|---------------------|-------------------|---------------------|-------------------|-------------------|-------------------------|
| Bore/stroke | mm | 170/195 | 170/195 | 170/195 | 170/195 | 170/195 | 170/195 | 170/195 | 170/195 |
| Displacement | dm ³ | 53.1 | 53.1 | 53.1 | 53.1 | 70.8 | 70.8 | 88.5 | 88.5 |
| Speed | min ⁻¹ | 1,500 | 1,500 | 1,500 | 1,500 | 1,500 | 1,500 | 1,500 | 1,500 |
| Mean piston speed | m/s | 9.8 | 9.8 | 9.8 | 9.8 | 9.8 | 9.8 | 9.8 | 9.8 |
| Lenght ³⁾ | mm | 4,660 | 4,660 | 4,790 | 4,790 | 5,430 | 5,430 | 6,200 | 6,200 |
| Width ³⁾ | mm | 1,810 | 1,810 | 1,810 | 1,810 | 1,810 | 1,810 | 1,710 | 1,710 |
| Height ³⁾ | mm | 2,210 | 2,210 | 2,210 | 2,210 | 2,210 | 2,210 | 2,190 | 2,190 |
| Dry weight genset | kg | 11,200 | 11,200 | 11,700 | 11,700 | 13,300 | 13,300 | 17,900 | 17,900 |

Natural gas applications

NO_x ≤ 500 mg / Nm³⁶⁾

| Engine type | TCG 2020 | V12 (i.o.) ¹⁾ | V12 K 1 ¹⁾ | V12 K ¹⁾ | V12 ²⁾ | V16 K ¹⁾ | V16 ²⁾ | V20 ²⁾ | V20 (iHE) ²⁾ |
|-------------------------------------|----------|--------------------------|-----------------------|---------------------|-------------------|---------------------|-------------------|-------------------|-------------------------|
| Electrical power ⁴⁾ | kW | 1,000 | 1,000 | 1,125 | 1,200 | 1,500 | 1,560 | 2,000 | 2,000 |
| Mean effective pressure | bar | 15.5 | 15.5 | 17.4 | 18.6 | 17.5 | 18.1 | 18.6 | 18.6 |
| Thermal output ⁵⁾ | ±8% kW | 1,057 | 1,177 | 1,253 | 1,190 | 1,675 | 1,580 | 1,977 | 1,912 |
| Electrical efficiency ⁴⁾ | % | 43.0 | 40.0 | 40.9 | 43.6 | 40.9 | 43.2 | 43.7 | 44.4 |
| Thermal efficiency ⁴⁾ | % | 45.4 | 47.0 | 45.6 | 43.3 | 45.7 | 43.8 | 43.2 | 42.5 |
| Total efficiency ⁴⁾ | % | 88.4 | 87.0 | 86.5 | 86.9 | 86.6 | 87.0 | 86.9 | 86.9 |

Biogas applications

NO_x ≤ 500 mg / Nm³⁶⁾

Sewage gas (65 % CH₄ / 35 % CO₂)
 Biogas (60 % CH₄ / 32 % CO₂, rest N₂)
 Landfill gas (50 % CH₄ / 27 % CO₂, rest N₂)

Minimum heating value H_U = 5.0 kWh / Nm³

| Engine type | TCG 2020 | V12 (i.o.) ¹⁾ | V12 ²⁾ | V16 ²⁾ | V20 ²⁾ |
|-------------------------------------|----------|--------------------------|-------------------|-------------------|-------------------|
| Electrical power ⁴⁾ | kW | 1,000 | 1,200 | 1,560 | 2,000 |
| Mean effective pressure | bar | 15.5 | 18.6 | 18.1 | 18.6 |
| Thermal output ⁵⁾ | ±8% kW | 1,037 | 1,194 | 1,577 | 2,012 |
| Electrical efficiency ⁴⁾ | % | 42.6 | 43.0 | 42.6 | 43.0 |
| Thermal efficiency ⁴⁾ | % | 44.2 | 42.8 | 43.1 | 43.3 |
| Total efficiency ⁴⁾ | % | 86.8 | 85.8 | 85.7 | 86.3 |

1) Version optimized for standalone operation and load compensation.
 2) Optimized efficiency version.
 3) Transport dimensions for gensets; components set up separately must be taken into consideration.

4) According to ISO 3046/1 at U = 0.4 kV, cosphi = 1.0 for 50 Hz and a methane number of MN 80 (TCG 2020) or MN 70 (TCG 2020K) for natural gas.
 5) Exhaust gas cooled to 120°C for natural gas and 180°C for biogas.
 6) NO_x ≤ 500 mg/Nm³; exhaust gas dry at 5% O₂.

Data for special gas and dual gas operation on request.
 The values given on these datasheets are for information purposes only and not binding. The information given in the offer is decisive.

Technical data 60 Hz

| Engine type | TCG 2020 | V12 K ¹⁾ | V12 ²⁾ | V16 K ¹⁾ | V16 ²⁾ | V20 ²⁾ |
|----------------------|-------------------|---------------------|-------------------|---------------------|-------------------|-------------------|
| Bore/stroke | mm | 170/195 | 170/195 | 170/195 | 170/195 | 170/195 |
| Displacement | dm ³ | 53.1 | 53.1 | 70.8 | 70.8 | 88.5 |
| Speed | min ⁻¹ | 1,500 | 1,500 | 1,500 | 1,500 | 1,500 |
| Mean piston speed | m/s | 9.8 | 9.8 | 9.8 | 9.8 | 9.8 |
| Lenght ³⁾ | mm | 5,970 | 5,970 | 6,640 | 6,640 | 7,470 |
| Width ³⁾ | mm | 1,790 | 1,790 | 1,790 | 1,790 | 1,710 |
| Height ³⁾ | mm | 2,210 | 2,210 | 2,210 | 2,210 | 2,190 |
| Dry weight genset | kg | 13,000 | 13,000 | 14,900 | 14,900 | 19,800 |

Natural gas applications

NO_x ≤ 500 mg / Nm³⁶⁾

| Engine type | TCG 2020 | V12 K ¹⁾ | V12 ²⁾ | V16 K ¹⁾ | V16 ²⁾ | V20 ²⁾ |
|-------------------------------------|----------|---------------------|-------------------|---------------------|-------------------|-------------------|
| Electrical power ⁴⁾ | kW | 1,125 | 1,200 | 1,500 | 1,560 | 2,000 |
| Mean effective pressure | bar | 17.4 | 18.7 | 17.6 | 18.3 | 18.7 |
| Thermal output ⁵⁾ | ±8% kW | 1,261 | 1,196 | 1,686 | 1,589 | 1,991 |
| Electrical efficiency ⁴⁾ | % | 40.7 | 43.4 | 40.6 | 43.0 | 43.4 |
| Thermal efficiency ⁴⁾ | % | 45.6 | 43.2 | 45.7 | 43.8 | 43.2 |
| Total efficiency ⁴⁾ | % | 86.3 | 86.6 | 86.3 | 86.8 | 86.6 |

Biogas applications

NO_x ≤ 500 mg / Nm³⁶⁾

Sewage gas (65 % CH₄ / 35 % CO₂)
 Biogas (60 % CH₄ / 32 % CO₂, rest N₂)
 Landfill gas (50 % CH₄ / 27 % CO₂, rest N₂)

Minimum heating value H_U = 5.0 kWh / Nm³

| Engine type | TCG 2020 | V12 ²⁾ | V16 ²⁾ | V20 ²⁾ |
|-------------------------------------|----------|-------------------|-------------------|-------------------|
| Electrical power ⁴⁾ | kW | 1,200 | 1,560 | 2,000 |
| Mean effective pressure | bar | 18.7 | 18.3 | 18.7 |
| Thermal output ⁵⁾ | ±8% kW | 1,200 | 1,588 | 2,026 |
| Electrical efficiency ⁴⁾ | % | 42.8 | 42.3 | 42.7 |
| Thermal efficiency ⁴⁾ | % | 42.8 | 43.1 | 43.2 |
| Total efficiency ⁴⁾ | % | 85.6 | 85.4 | 85.9 |

1) Version optimized for standalone operation and load compensation.
 2) Optimized efficiency version.
 3) Transport dimensions for gensets; components set up separately must be taken into consideration.

4) According to ISO 3046/1 at U = 0.48 kV, cosphi = 1.0 for 60 Hz and a methane number of MN 80 (TCG 2020) or MN 70 (TCG 2020K) for natural gas.
 5) Exhaust gas cooled to 120°C for natural gas and 180°C for biogas.
 6) NO_x ≤ 500 mg/Nm³; exhaust gas dry at 5% O₂.

Data for special gas and dual gas operation on request.
 The values given on these datasheets are for information purposes only and not binding. The information given in the offer is decisive.

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